REMARKS

Reconsideration and withdrawal of the rejections are respectfully requested in view of the amendments and remarks herein.

I. STATUS OF CLAIMS AND FORMAL MATTERS

Claims 40-66 are pending in this application. All previously pending claims have been cancelled without prejudice.

No new matter is added. Support for the amended claims is found throughout the specification and from the claims as previously pending.

It is submitted that these claims are patentably distinct from the references cited by the Examiner, and that these claims are in full compliance with the requirements of 35 U.S.C. §112. The amendments of the claims herein are not made for the purpose of patentability within the meaning of 35 U.S.C. §§ 101, 102, 103 or 112; but rather the amendments are made simply for clarification and to round out the scope of protection to which Applicants are entitled. Furthermore, it is explicitly stated that the herewith amendments should not give rise to any estoppel, as the herewith amendments are not narrowing amendments.

II. THE REJECTIONS UNDER 35 U.S.C. §112, 1ST PARAGRAPH, ARE OVERCOME

The Application Contains Adequate Written Description

Claims 1, 21, 26-28, 30, 31, 34, 35, 38 and 39 were rejected under 35 U.S.C. §112, first paragraph, as allegedly lacking adequate written description. The rejection is traversed. Throughout the Office Action, reference is made to "Applicant's arguments filed 1/18/03". Since Applicants did not file any arguments on January 18, 2003, it is requested that the Examiner confirm that the arguments filed on November 8, 2002 were fully considered.

The Office Action appears to have misinterpreted what is disclosed and claimed in the instant application. "Applicant describes six sequences (SEQ ID NO: 7-12 that encode SEQ ID NO: 1-6) sequences presumably from a single organism, and only four of which show significant relatedness (SEQ ID NO: 7, 8, 11, 12 encode SEQ ID NO: 1, 2, 5, 6) and are presumed to encode glucan lyase." (Office Action, page 3.)

Firstly, the described sequences are not from a single organism, as alleged in the above statement. The nucleic acid molecules of SEQ ID NOs:7 and 8, encoding the polypeptides of SEQ ID NOs:1 and 2, respectively, were isolated from fungally infected algae, as described in PCT publication WO 95/10618 (copy attached). SEQ ID NOs:1 and 2 of the present application

correspond to SEQ ID NOs:1 and 2 of WO 95/10618. The nucleic acid molecules of SEQ ID NOs:9 and 10, encoding the polypeptides of SEQ ID NOs:3 and 4, respectively, were isolated from two different species of the *Morchella* genus of fungi, as described in PCT publication WO 95/10617 (copy attached). SEQ ID NOs:3 and 4 of the present application correspond to SEQ ID NOs:1 and 2 of WO 95/10617. The nucleic acid molecules of SEQ ID NOs:11 and 12, encoding the polypeptides of SEQ ID NOs:5 and 6, respectively, were isolated from algae, as described in PCT publication WO 96/12026, which has already been made of record in this application. SEQ ID NOs:5 and 6 of the present application correspond to SEQ ID NOs:3 and 4 of WO 96/12026. Therefore, the glucan lyases disclosed in the present application are not from a single organism, as stated in the Office Action.

Secondly, the disclosed glucan lyases, corresponding to SEQ ID NOs:1-6, show a greater degree of relatedness than is stated in the Office Action. For example, SEQ ID NOs:3 and 4 are 85% identical to one another, and although they have limited structural similarity to the enzymes of SEQ ID NOs:1, 2, 5 and 6, they are functionally related, in that they catalyze the same reaction.

Thirdly, the molecules of SEQ ID NOs:7-12 are not "presumed to encode glucan lyase", as is stated in the Office Action; they do encode glucan lyase, as is demonstrated by the functional assays described in WO 95/10617, WO 95/10618 and WO 96/12026, which confirm the enzymatic activity of SEQ ID NOs:1-6.

As a further matter of note, the instant application does not claim the molecules in question; rather, these molecules are described in detailed in WO 95/10617, WO 95/10618 and WO 96/12026. To the contrary, the instant application claims methods for increasing the levels of anhydrofructose *in situ* in a plant or plant part, and for preparing a foodstuff comprising anhydrofructose from a plant or plant part in which anhydrofructose has been expressed *in situ*. The skilled artisan is able to use any of the glucan lyases known in the art to attain the methods of the invention.

The Office Action goes on to allege on page 3 that "Applicant does not provide adequate written description to support a genus of DNAs with at least 75%, 85% or 90% identity to SEQ ID NO:7, because Applicant has only described a single DNA, namely SEQ ID NO:7, encompassed by the genus". Although Applicants dispute this allegation, the claim language has been modified to recite sequence identity at the amino acid level.

The Specification Is Enabling

Claims 1, 21, 26-31, 33-35 and 37-39 were rejected under 35 U.S.C. §112, first paragraph, as allegedly lacking enablement. The rejection is traversed.

The Office Action states, on page 4, that "Applicant has not provided any working examples of transformation of any glucan lyase into any plant and the state of the art teaches that high levels of enzyme production in transgenic plants are not routinely obtained." The Examiner's attention is directed to the enclosed Declaration Under Rule 37 CFR 1.132 by Dr. Anders Boegh Jensen ("the Declaration"). The Declaration clearly shows that one can achieve the claimed invention using the disclosure of the present application and the common knowledge of the skilled artisan at the time of filing.

The nucleic acid sequence encoding SEQ ID NO:1 was used to transform potato and *Arabidopsis* plants. Elevated levels of anhydrofructose were attained in both potato and *Arabidopsis* plants, refuting the allegation that an undue amount of experimentation would be required to practice the claimed invention. In addition, the fact that success was achieved in two different plants provides strong evidence that the claimed methods could be applied to any plant. This is because starch, the substrate of the reaction catalyzed by glucan lyase, is present in the plastids of all plants, and these plastids provide the same environment for the enzyme reaction to take place in all plants. The transformation of any plant species would have been routine for a skilled artisan at the priority date of the present application.

It is submitted that the claims are adequately described and enabled by the application, and that they meet the requirements of 35 U.S.C. §112. Consequently, reconsideration and withdrawal of the rejections under Section 112, first paragraph, are requested.

III. THE REJECTIONS UNDER 35 U.S.C. §103 ARE OVERCOME

Claims 21, 28 and 32-39 were rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Yu *et al.* in view of Perl *et al.* Claims 1, 9, 26, 27 and 29-31 were rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Yu *et al.* in view of Perl *et al.* The rejections are traversed and will be addressed collectively.

The instant invention provides methods for increasing the level of antioxidants, specifically anhydrofructose, in plants or plant parts, and for preparing foodstuffs comprising anhydrofructose the plants or plant parts. In contrast, Yu *et al.* does not teach or suggest the transformation of plants with glucan lyase to produce increased levels of anhydrofructose in the

plants, nor does it teach or suggest the preparation of foodstuffs from such plants. Yu *et al.* is focused on providing nucleic acid and amino acid sequences for glucan lyase, and on the production of large quantities of glucan lyase. (See the paragraph beginning at column 2, line 17.)

The Office Action asserts on page 5 that "Yu *et al.* teaches expression of a cDNA from a fungal source expressing glucan lyase in a host capable of the starch degradation pathway for the purpose of producing anhydrofructose, an antioxidant." Contrary to this statement, the only utility for glucan lyase or anhydrofructose suggested in Yu *et al.* is the use of anhydrofructose in the preparation of an antibiotic (column 1, line 17 and column 2, line 24). It is not disclosed in Yu *et al.* that anhydrofructose is an antioxidant, nor is it suggested that it would be desirable to express it in plants that are used in the preparation of foodstuffs.

In addition, in algae and fungi, where anhydrofructose is produced endogenously, anhydrofructose is an intermediate product that is metabolized into secondary products, such as microthecin and ascopyrone P. Thus, a skilled person prior to the present application would not necessarily have considered the production of anhydrofructose, *in situ*, in a plant, as a viable way to produce an antioxidant *in situ*.

Furthermore, Yu *et al.* does not teach expression of glucan lyase "in a host capable of the starch degradation pathway". Yu *et al.* teaches production of glucan lyase in microorganisms, as is clearly stated in column 16 of Yu *et al.*, *i.e.*, that the transformed organisms contemplated by the inventors are microorganisms. Plants are not even mentioned in the list of potential hosts. There is simply no motivation provided by Yu *et al.* to transform plants with glucan lyase to increase the level of anhydrofructose in the plants.

The prior art references must be read with the mindset of the skilled person in May, 1997. At that time, it was only known to add antioxidants as "chemical" additives (some of which, such as sulphur dioxide, are potentially harmful chemicals) to foodstuffs. At that time, the focus was on how to increase the production of anhydrofructose as an additive. Such additives were commonly made in microbiological processing plants. Therefore, a skilled person reading Yu *et al.* in 1997 would have considered it to be a teaching of how anhydrofructose may be produced in a microbiological processing facility. A skilled person would not have been motivated by Yu *et al.* to produce the anhydrofructose directly *in situ* in a foodstuff. As discussed above, Yu *et al.* does not even mention plants (or foodstuffs).

The deficiencies of Yu *et al.* are not remedied by Perl *et al.* In fact, if anything Perl confirms the skilled person's mindset in 1997, which would have been to add anhydrofructose as an additive, rather than producing it *in situ* in the plant. In that regard, prior to the present invention, the skilled person would have been directed away from producing a "new" carbohydrate in plants, as carbohydrates which are not normally present in a plant cell are often toxic to a plant. For instance, both mannose and glucosamine are toxic to plant cells.

Applicants do not assert, as is alleged in the last paragraph on page 5 of the Office Action, that the addition of an antioxidant to a foodstuff is not obvious. What the Applicants do assert is that the production *in situ* of an antioxidant in a foodstuff or foodstuff component is not obvious. The Examiner has not produced a prior art reference, or combination of references, that describes and enables, or even suggests the desirability of, transforming a plant or plant part that will be used in making a foodstuff, or will itself be a foodstuff, to produce an increased amount of anhydrofructose, thereby increasing the nutritional value of the foodstuff or obviating the need for chemical additives to the foodstuff.

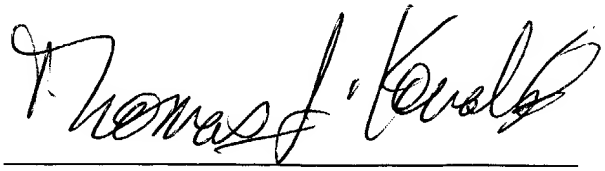
It is submitted that the invention is non-obvious and patentable over the cited references. Accordingly, reconsideration and withdrawal of the rejections under 35 U.S.C. §103 are requested.

CONCLUSION

Applicants believe that the application is in condition for allowance, and favorable reconsideration of the application and prompt issuance of a Notice of Allowance are earnestly solicited.

Respectfully submitted,

FROMMER LAWRENCE & HAUG LLP

By: 

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